

A NEW HORIZON - AUSTRALIA IN THE GLOBAL SPACE RACE

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"Inspired by the great prospects opening up before mankind as a result of man's entry into outer space, ..."

Preamble to the *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, 13 December 1963

From 1 July 2018 Australia will have its own national space agency, the ASA, with seed funding of \$41 million in the first four years and further potential investment through a Space Industry Development Fund and major, national space-related projects on a quadrennial basis.¹

Australia has been deeply involved in space research from the dawn of the space age, even before Sputnik 1 was launched, especially at the Weapons Research Establishment at Woomera.² Australia has also previously had a space agency, the Australian Space Office (ASO), and a National Space Program (NSP), from 1987 to 1996.³

Current circumstances are fundamentally different to those 22 years ago when the ASO and NSP was terminated. There are strong reasons for optimism⁴ about the success of a new ASA and national strategy for civil space,⁵ not least of which is that the current resurgence of the Australian space industry is largely commercially-driven and by home-grown innovation and enterprise.

- 1 Australian Government Response to Expert Reference Group Report 'Review of Australia's Space Industry Capability' (hereinafter 'Government Response to Clark Report') at <<https://www.industry.gov.au/industry/IndustrySectors/space/Documents/Australian-Government-Response-to-the-Review-of-Australian-Space-Industry-Capability.pdf>>.
- 2 Dougherty, Kerrie, *Australia in Space* (Hindmarsh, SA: ATF Press, 2017), pp 9 – 46.
- 3 Dougherty, above fn 3, pp 168 – 172.
- 4 Biddington, Brett, 'The Australian Space Agency: rhetoric and reality' in *The Strategist* (Australian Strategic Policy Institute, 27 April 2018) at <<https://www.aspistrategist.org.au/australian-space-agency-rhetoric-reality/>>.
- 5 Clark, Megan (ed), *Report of the Expert Reference Panel – Review of Australia's Space Industry Capability* (Canberra, ACT: Australian Department of Industry, Innovation and Science, March 2018) (hereinafter 'Clark Report'), p 38. <https://www.industry.gov.au/industry/IndustrySectors/space/Documents/FINAL_ERG-Review-Report_10-May_accessible.pdf>.
- 6 *Clark Report*, above fn 6, p 27.
- 7 The Space Foundation, *The Space Report 2016: The Authoritative Guide to Global Space Activity* (Colorado Springs, CO: The Space Foundation, 2016) (hereinafter 'Space Report 2016'), p vii.
- 8 Australia's GDP represents 1.94% of the world economy (see, *Trading Economics*, website accessed on 22 May 2018 at <<https://tradingeconomics.com/australia/gdp>>). If the global space economy continues to grow at the same rate (see below fn 11 and fn 12), then the global space economy would be worth over USD900 billion in 2030. If Australia's share of the global space economy matched our share of the global economy generally, Australia's share would be around USD18 billion in 2030. This involves a lot of variables and could only be considered highly speculative.
- 9 *Space Report 2016*, above fn 8, p vii. See also *Global Space Industry Dynamics* research paper available at <<https://www.industry.gov.au/industry/IndustrySectors/space/Documents/BRYCE-Australia-Global-Space-Industry-Dynamics-Paper.pdf>>.
- 10 Morgan Stanley, *Space: Investing in the Final Frontier* (Morgan Stanley, 13 November 2017) at <<https://www.morganstanley.com/ideas/investing-in-space>>.
- 11 Sheetz, Michael, *The space industry will be worth nearly \$3 trillion in 30 years, Bank of America predicts* (CNBC, 31 October 2017) <<https://www.cnbc.com/2017/10/31/the-space-industry-will-be-worth-nearly-3-trillion-in-30-years-bank-of-america-predicts.html>>.
- 12 *Clark Report*, above fn 6, p 6.
- 13 See the following Australian space start-ups, for example: SkyKraft <<https://newsroom.unsw.edu.au/news/science-tech/new-partnership-advances-australia's-space-mission-capabilities>> and Innovor <<https://www.inovor.com.au/products/>>.
- 14 See, for example, the research of UNSW Canberra Space <<https://www.unsw.adfa.edu.au/space-research/space-research/research-themes/satellite-formation-flying>>.
- 15 Hampson, Joshua, *The Future of Space Commercialisation* (Washington, DC: Niskanen Center, 25 January 2017), pp 7 – 11.
- 16 Peterson, Ray, *Insatiable Demand for Data and Connectivity Drive Commercial Satellite Market* (Forecast International, 12 September 2016) at <<https://globenewswire.com/news-release/2016/09/12/871248/10165067/en/Forecast-International-Insatiable-Demand-for-Data-and-Connectivity-Drive-Commercial-Satellite-Market.html>>.
- 17 Pearce, Rupert (Chair, Broadband Commission for Sustainable Development), *Working Group on Technologies in Space and the Upper-Atmosphere: Identifying the potential of new communications technologies for sustainable development* (ITU and UNESCO, September 2017), throughout and especially p 14 at <<http://www.broadbandcommission.org/Documents/publications/WG-Technologies-in-Space-Report2017.pdf>>. See also the 'Other 3 Billion' project, especially aimed at bringing satellite

connectivity to less developed nations, at <<https://www.ses.com/newsroom/seamlessly-scaling-our-o3b-fleet-meet-exponential-demand-connectivity>>.

¹⁸ In Australia for example, Fleet Space Technologies and Myriota are seeking to service this market; see <<https://www.fleet.space>> and <<http://myriota.com>>.

¹⁹ Christensen, Ian, 'Small Satellites – Opportunities & Challenges for New Actors in Space', presentation delivered at *Small Satellites Tech, Business & Regulatory Industry Workshop* (European Centre for Space Law, 13 April 2017).

²⁰ Bryce Space and Technology, *State of the Satellite Industry Report 2017* (Washington, DC: Satellite Industry Association, June 2017), p 27 at <<https://www.sia.org/wp-content/uploads/2017/07/SIA-SSIR-2017.pdf>>. In Australia, for example, see Gilmour Space Technologies at <<https://www.gspacetechnology.com>>.

²¹ In Australia, for example, see Cingulan Space at <<http://www.cingulanspace.com.au>>.

²² UK Space Agency, *The Size and Health of the UK Space Industry* (London: UK Space Agency, 2016), p 1 at <<https://www.gov.uk/government/publications/uk-space-industry-size-and-health-report-2016>>.

²³ *Clark Report*, above fn 6, p 27.

²⁴ *Clark Report*, above fn 6, p 18.

²⁵ See: SkyKraft <<https://newsroom.unsw.edu.au/news/science-tech/new-partnership-advances-australia-s-space-mission-capabilities>> and Innovor <<https://www.inovor.com.au/products/>>.

²⁶ In addition to fn 26 above, see the Advanced Instrumentation Technology Centre at the Australian National University <<https://rsaa.anu.edu.au/aitc>>. See also the Australian National Concurrent Design Facility at UNSW Canberra <<https://www.unsw.adfa.edu.au/space-research/news/ancdf-australian-national-concurrent-design-facility-official-opening>>.

²⁷ In addition to fn 26 above, Fleet Space is establishing a Mission Control Centre in Adelaide – see: <<https://www.defenceconnect.com.au/intel-cyber/1786-new-mission-control-centre-launches-sa-as-australia-s-space-hub>>.

²⁸ Gilmour Space Technologies at <<https://www.gspacetechnology.com>>.

²⁹ Equatorial Launch Australia <<https://ela.space>> and Southern Launch <<https://southernlaunch.space>>.

³⁰ The Off Earth Mining Forum will convene for the fourth consecutive year in Sydney in September this year; see <<http://www.acser.unsw.edu.au/oemf2017>>.

³¹ Dougherty, above fn 3, pp 9 – 50.

³² Dougherty, above fn 3, pp 146 – 151.

³³ Australian Department of Industry, Innovation, Science, Research and Tertiary Education, *Australian Satellite Utilisation Policy* (Canberra, ACT: DIISRTE, 2013) (hereinafter, 'Australian Satellite Utilisation Policy'), p 12 at: <<https://industry.gov.au/industry/IndustrySectors/space/Documents/Australias-satellite-utilisation-policy.pdf>>.

³⁴ Blake, Duncan, *Submission of International Aerospace Law & Policy Group (IALPG) to the Australian Government Review of Australia's Space Industry Capability* (Canberra, ACT: IALPG, 2017), p 8.

³⁵ Australian Department of Defence, *Defence White Paper 2016* (Canberra: Defence Publishing Service, 25 February 2016), p 52, at: <<http://www.defence.gov.au/whitepaper>>.

³⁶ *Australian Satellite Utilisation Policy*, above fn 34.

³⁷ A list is provided in *Clark Report*, above fn 6, Appendix 4.

³⁸ *Clark Report*, above fn 6, p 18.

³⁹ Good examples are people like Michael Davis <<https://www.youtube.com/watch?v=XCsl7IxsJhc>>, Andrew Dempster <<https://theconversation.com/ten-reasons-why-australia-urgently-needs-a-space-agency-16386>>, Brett Biddington <<https://theconversation.com/australia-will-soon-have-a-national-space-policy-no-giggling-please-9917>>, Naomi Mathers <<https://www.linkedin.com/in/naomi-mathers/>>, Russell Boyce <<https://research.unsw.edu.au/people/professor-russell-robert-boyce>> and others.

- 40 *Clark Report*, above fn 6, p 28.
- 41 Union of Concerned Scientists, *Satellite Database*, at: <https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WwEeA_ZuUF>.
- 42 United Nations Office of Outer Space Affairs, *Online Index of Objects Launched into Outer Space* (Vienna: UNOOSA, 21 May 2018) at: <http://www.unoosa.org/oosa/osoindex/search-ng.jsp?lf_id>.
- 43 United States Air Force, *Space Surveillance* (USAF, accessed 21 May 2018) at: <<http://www.au.af.mil/au/awc/awcgate/usspc-fs/space.htm>>.
- 44 Different figures are given by different organisations, depending on policies on reporting tracked, known, or catalogued objects. Compare NASA, *Space Debris and Human Spacecraft* (NASA, 7 February 2017) at: <https://www.nasa.gov/mission_pages/station/news/orbital_debris.html> with Space-Track.org, *Satellite Situation Report* (website accessed on 22 May 2018) at: <<https://www.space-track.org/#/ssr>>.
- 45 Al-Radhan, Najef, 'Why technological innovation and increased cooperation regarding space debris are vital' in *The Space Review* (SpaceNews, 26 February 2018) at: <<http://www.thespacereview.com/article/3438/1>>.
- 46 Blake, Duncan, 'Step up Australia, we need a traffic cop in space' in *The Conversation* (The Conversation, 17 November 2017) at <<https://theconversation.com/step-up-australia-we-need-a-traffic-cop-in-space-86464>>.
- 47 La Vone, Michelle, 'The Kessler Syndrome: 10 Interesting and Disturbing Facts' in *Space Safety Magazine* (International Association for Advancement of Space Safety, 2014) at: <<http://www.spacesafetymagazine.com/space-debris/kessler-syndrome/>>.
- 48 Jakhu, Ram S, 'Legal Issues Relating to the Global Public Interest in Outer Space – The Vision for Space Exploration: A Dedicated Issue' (2006) 32 *Journal of Space Law* 31, pp 72 – 76.
- 49 Goldfein, David (General, United States Air Force, Chief of Staff), Presentation at *Air Warfare Symposium* (Orlando, FL: USAF, 23 February 2018) at: <<http://spacenews.com/air-force-chief-goldfein-well-be-fighting-from-space-in-a-matter-of-years/>>.
- 50 Westwood, Chris, 'Securing Space: Australia's Urgent Security Policy Challenge' in *Australian Defence Force Journal* (Issue 1, 2017, 35), at: <http://www.defence.gov.au/adc/adfj/Documents/issue_201/201_2017_May_Jun.pdf>.
- 51 Weeden, Brian and Samson, Victoria (eds), *Global Counterspace Capabilities: An Open Source Assessment* (Washington, DC: Secure World Foundation, April 2018) at: <https://swfound.org/media/206118/swf_global_counterspace_april2018.pdf>.
- 52 McLaughlin, Robert and Schmitt, Michael and Stephens, Dale (eds), *The Woomera Manual on the International Law of Military Space Operations* (Woomera, SA: The Woomera Manual Project, 2018) at: <<https://law.adelaide.edu.au/woomera/>>.
- 53 Harrison, Todd et al, *Implications of Ultra Low Cost Access to Space* (Washington, DC: Center for Strategic and International Studies, 21 March 2017) at: <<https://www.csis.org/analysis/implications-ultra-low-cost-access-space>>.
- 54 United Nations, *Sustainable Development Goals 2030* (Geneva: United Nations, 2015) at: <<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>>.
- 55 Pearce, Rupert, above fn 18.
- 56 Article I, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, [1967] ATS 24 (entered into force 10 October 1967) (hereinafter '*Outer Space Treaty*') at: <<http://www.oosa.unvienna.org/oosa/en/SpaceLaw/outerspt.html>>.
- 57 Prior, Timothy et al, *Resource depletion, peak minerals and the implications for sustainable resource management*, presentation at the *International Society for Ecological Economics 11th Biennial Conference* (Oldenburg/Bremen, Germany: ISEE 22-25 August 2010) at: <<http://cfsites1.uts.edu.au/find/isf/publications/prioretal2010resource depletion.pdf>>.
- 58 The need for a 'back-up' for planet Earth and the imperative to explore are the most common rationales typically put forward for space colonisation, but the concept remains controversial. See, for example, Bergan, Brad, 'Colonize or Become Extinct: Is There Any Real

Rationale for Colonizing Another World?' in *Futurism* (Futurism, 8 November 2017) at:

<<https://futurism.com/human-extinction-mars/>>.

⁵⁹ Weeden, Brian, 'Commercial space innovation needs more government certainty' in *SpaceNews* (Washington, DC: Space News, 15 March 2017) at:

<<http://spacenews.com/commentary-commercial-space-innovation-needs-more-government-certainty/>>.

⁶⁰ Article VI, *Outer Space Treaty*, above fn 56.

⁶¹ von der Dunk, Frans, 'Towards flags of convenience in space' paper delivered at *IISL-ECSL Symposium 2012* (Vienna: IISL and ECSL, March 2012) at:

<<https://digitalcommons.unl.edu/spacelaw/76/>>.

⁶² As of 22 May 2018 the *American Space Commerce Free Enterprise Act* had been received in the Senate and referred to the Committee on Commerce, Science and Transportation, at:

<<https://www.congress.gov/bill/115th-congress/house-bill/2809>>.

⁶³ Under §51303 of the *U.S. Commercial Space Launch Competitiveness Act*.

⁶⁴ Article II, *Outer Space Treaty*, above fn 56.

⁶⁵ *Loi sur l'exploration et l'utilisation des ressources de l'espace*, passed on 13 July 2017

<<http://www.luxembourg.public.lu/en/actualites/2017/07/21-spaceresources/index.html>> with draft text at: <<http://www.luxembourg.public.lu/fr/actualites/2016/11/11-space-resources/projet-de-loi-espace.pdf>>.

⁶⁶ Department of Industry, Innovation and Science, *Reform of Space Activities Act* (Canberra, ACT: DIIS, 2018) at: <<https://industry.gov.au/industry/IndustrySectors/space/Pages/Review-of-the-Space-Activities-Act-1998.aspx>>.

⁶⁷ Article I, *Outer Space Treaty*, above fn 56.

⁶⁸ Pearce, Rupert, above fn 18, p 14.

⁶⁹ Originally conceived as a project focussed on the developing world, the O3B network is now a broader network providing global connectivity, of which a component is in the developing world – see: <<https://www.ses.com/networks/o3b-mpower>>.

⁷⁰ Government Response to Clark Report, above fn 2.

⁷¹ An Australian was recently the chair of CEOS – see Plenary session held in Brisbane on 1 – 2 November 2016:

<http://ceos.org/document_management/Meetings/Plenary/30/Final%20Minutes/CEOS-30_Minutes_v1.0.pdf>.

⁷² Australia has been represented at COSPAR by the Australian Academy of Science for many years <<https://cosparhq.cnes.fr/about/national-scientific-institutions>> and in 2020 will host COSPAR in Sydney <<http://www.cospar2020.org/>>.

⁷³ There are already Australian 'incubators', 'accelerators' and other programs that do just that, and the ASA should support these enterprises, as well as the innovators themselves. See, for example, Moonshot <<https://www.moonshot.space.co>>, Delta V NewSpace Alliance

<<http://www.deltavspacehub.com>> and Space Hub Perth <<https://www.corehub.com.au/space-hub-perth/>>.

⁷⁴ Australian Government Space Coordination Committee, *State of Space Report 2017*, pp 13 – 14 at:

<<https://industry.gov.au/industry/IndustrySectors/space/Documents/2017%20State%20of%20Space%20report.pdf>>.

⁷⁵ *Clark Report*, above fn 6, p 38.

⁷⁶ Al-Radhan, Najef, above, fn 46.

⁷⁷ See for example Slater, Alexander 'Space Debris: a Law and Economics Analysis of the Orbital Commons' *Stanford Technology Law Review* (2016) at: <https://law.stanford.edu/wp-content/uploads/2017/11/19-2-2-salter-final_0.pdf> and Emanuelli, Marreo; Chow, Tiffany; Prasad, Deva; Federica, Giulia and Loughman, Joshua; 'Conceptualizing An Economically, Legally And Politically Viable Active Debris Removal Option' paper delivered at the 64th *International Astronautical Congress* (Beijing: IAF, September 2013) at:

<https://swfound.org/media/119724/iac-13,a6,8,1,x18123_tc.pdf>.

78 Nyampong, Yaw 'Legal and Regulatory Challenges to Active Debris Removal and On-Orbit Satellite Servicing Activities' paper delivered at the *Secure World Foundation and Singapore Space and Technology Association Conference on On-Orbit Satellite Servicing and Active Debris Removal: Opportunities and Challenges for the Space Sector* (Singapore: SWF and SSTA, February 2013) at: <https://swfound.org/media/101969/yaw-legal_regulatory_challenges.pdf>.

79 Blake, Duncan, above fn 47.

80 A good account of the SSA sensors already in operation in Australia is provided by UNSW Canberra, *Space Situational Awareness* (website accessed on 22 May 18) at: <<https://www.unsw.adfa.edu.au/space-research/research-themes/space-situational-awareness>>. Other sensors are being moved to Australia or developed in Australia: see May, Darren, *Australian Defence Space Situational Awareness Activities* at: <http://www.jsforum.or.jp/stableuse/2017/pdf/11_Group%20Captain%20Darren%20May.pdf>.

81 See <<http://skykraft.com.au/>>.

82 See <<http://www.eos-aus.com/>>.

83 See <<http://neumannspace.com/>>.

84 Air Services Australia, *Guide to Our Operations*, p 3, at: <http://www.airservicesaustralia.com/wp-content/uploads/12-058BKT_Guide-to-our-operations_WEB.pdf> and Australian Maritime Safety Authority, *Australia's search and rescue region* (AMSA, 13 November 2017) at: <<https://www.amsa.gov.au/safety-navigation/search-and-rescue/australias-search-and-rescue-region>>.

85 Ellis, David, 'Celebrating Uni of Adelaide's Space Research and Innovation' in *University of Adelaide News & Events* (Adelaide, SA: 28 November 2017) at: <<https://www.adelaide.edu.au/news/news96822.html>>.